

Virginia Department of Health
Botulism: Guidance for Health Care Providers
Key Medical and Public Health Interventions
after Identification of a Suspected Case

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1. Epidemiology

Botulism is a rare but serious paralytic illness caused by a nerve toxin produced by the anaerobic spore-forming bacterium *Clostridium botulinum* and sometimes by strains of *Clostridium baratii* and *Clostridium butyricum*. Of the seven recognized subtypes of neurotoxins (A–G), only types A, B, E, and rarely F cause human disease. There are five main kinds of botulism, depending on the route of acquisition: foodborne, infant, wound, adult intestinal toxemia, and iatrogenic. A sixth form, inhalation botulism, has recently been described. Each of these types of botulism is described below. **One case of botulism is considered a medical emergency because any form of botulism can be fatal. One case of foodborne botulism is also considered a potential public health emergency because of the possibility that other persons had food exposures in common.**

- Foodborne botulism occurs because of consumption of preformed botulinum toxin, most commonly with improperly processed home-canned foods. Foods most commonly contaminated are home-canned vegetables, cured pork and ham, and smoked or raw fish. Commercially canned foods rarely cause botulism.
- Infant botulism (i.e., intestinal botulism), the most common form of botulism, occurs with ingestion of *C. botulinum* spores which germinate in the intestine and then release toxin. Children under 12 months of age can be affected and most cases occur in those aged 6 weeks to 6 months.
- Wound botulism occurs, rarely, when spores get into an open wound and reproduce in an anaerobic environment and produce toxin. Wound botulism has been reported among injection drug users.
- Adult intestinal toxemia (also known as adult intestinal colonization) botulism is a very rare kind of botulism that occurs in immunocompromised adults, those using antimicrobials, or those with an anatomical or functional bowel abnormality, by the same route as infant botulism.

- Iatrogenic botulism occurs from accidental overdose of therapeutic botulinum toxin.
- Recently, inhalation botulism has been described. Inhalation botulism is a form of botulism that does not occur naturally. It is caused by aerosolized botulinum toxin, a possible mechanism for a bioterrorism attack. Clinically, inhalation botulism cannot be differentiated from the naturally-occurring forms.

Botulism occurs worldwide and all persons are susceptible. Botulism is rare in the United States, including Virginia. Approximately 110 cases of botulism are reported annually in the United States. Most reported cases involve infant botulism.

Clostridium botulinum is designated as a Category A bioterrorism agent (i.e., easily disseminated or transmitted with a higher rate of mortality than Category B agents) and a select agent which means that it could be developed as a bioterrorism agent and that possession, use or transfer of these organisms requires registration with CDC or USDA. If botulism is suspected or confirmed, the local health department must be notified immediately so that a public health investigation can be initiated. To locate your local health department, see www.vdh.virginia.gov/LHD/index.htm.

2. Clinical Manifestations

Foodborne Botulism

- **Incubation period:** typically 12–36 hours (range 6 hours–10 days)
- **Symptoms:** Early symptoms are often fatigue, weakness and vertigo, followed by double and blurred vision, dry mouth, and difficulty in swallowing and speaking as a result of toxin effects on the cranial nerves. Flaccid, symmetric, and descending paralysis is a typical symptom, developing from the shoulders to upper and lower arms, thighs, and calves. The paralysis can affect the muscles used for breathing. In severe cases, respiratory failure may occur. Gastrointestinal symptoms, including nausea, vomiting, constipation, abdominal swelling and less commonly, diarrhea, may occur. Loss of consciousness and fever typically do not occur, unless a complicating infection is also present.

Infant (Intestinal) Botulism

- **Incubation period:** Unknown
- **Symptoms:** Early symptoms are often constipation, loss of appetite, weakness, lethargy, poor suck, ptosis, difficulty swallowing, altered cries, loss of head control, hypotonia. Infant botulism has a wide spectrum of clinical severity, ranging from mild illness to sudden infant death. Progression is more severe in those aged less than two months.

Wound Botulism

- **Incubation period:** approximately 7 days (range 4 days–21 days)
- **Symptoms:** Similar to foodborne botulism

Adult intestinal toxemia botulism

- **Incubation period:** Unknown
- **Symptoms:** Similar to foodborne botulism. The onset is generally gradual and less dramatic. In some cases, diarrhea due to *Clostridium difficile* co-infection has been reported.

Iatrogenic Botulism

- **Incubation period:** Unknown
- **Symptoms:** Generalized weakness, dysphagia, and respiratory distress are the primary symptoms of iatrogenic botulism resulting from overdose of botulinum toxin.

Inhalation Botulism

- **Incubation period:** approximately 12–80 hours
- **Symptoms:** Mucus in throat, difficulty swallowing, dizziness, difficulty moving eyes, mild pupillary dilation and involuntary eye movement, indistinct speech, unsteady gait, and extreme weakness.
Note: Inhalation botulism does not occur naturally; therefore, intentional aerosolization of botulinum toxin should be suspected if a clustering of cases occurs.

3. Specimen Collection and Laboratory Testing

Protocols for sentinel laboratories are no longer posted on the CDC website. The American Society for Microbiology has agreed to take the lead in the development and dissemination of sentinel laboratory information. The current guidelines for specimen collection and laboratory testing for botulism are available at http://www.asm.org/images/PSAB/Botulism_July2013.pdf.

For a suspected case of botulism, Virginia's Division of Consolidated Laboratory Services (DCLS) would perform initial testing and additional testing might be conducted at CDC as needed. DCLS and the Virginia Department of Health should be consulted if botulism is suspected. The DCLS Emergency Services Officer can be reached 24 hours a day/7 days a week at (804) 335-4617. Please note that botulism toxins are extremely poisonous. Exposure to the toxin represents the primary laboratory hazard.

Table 1 lists specimens recommended by the American Society for Microbiology for botulism testing. Specimens should be collected before treatment with antitoxin.

4. Diagnosis

Confirmation of botulism relies on the detection of botulinum toxin in a clinical specimen (or food, if applicable) or isolation of *Clostridium botulinum* from a clinical specimen. The current CDC case definition for botulism is available at <http://wwwn.cdc.gov/nndss/script/casedefDefault.aspx>. Note that a case definition is set of uniform criteria used to define a disease for public health surveillance. Case definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

Table 1. Sample collection for suspected botulism cases and testing at DCLS*

Laboratory Test	Samples [†]	Amount	Instructions
Botulism laboratory confirmation (mouse bioassay, ELISA, mass spectrometry, PCR)	Serum	10 mL sera (~20 mL whole blood)	Use red top or serum separator tubes to obtain serum (no anticoagulant). Store specimens at 4°C. Ship on cold packs as soon as possible. Note: Serum volumes < 5 mL will provide inconclusive results and whole blood should not be sent as it typically undergoes excessive hemolysis during transit.
	Stool	10–50 grams	Place into sterile unbreakable container (do not use transport media). Store specimens at 4°C. Ship on cold packs as soon as possible.
	Enema	20 mL	Place in a sterile unbreakable container. Store specimens at 4°C. Ship on cold packs as soon as possible. If an enema is given because of constipation, a minimal amount of fluid (preferably sterile, nonbacteriostatic water) should be used to obtain the specimen so that the toxin will not be unnecessarily diluted.
	Gastric aspirate or vomitus	20 mL	Place in sterile unbreakable container. Store specimens at 4°C. Ship on cold packs as soon as possible.
	Tissue, exudate or wound swab	Small amount of tissue / 2 swabs	Place specimen into sterile unbreakable container with anaerobic transport media. Store and transport without refrigeration.
	Food samples (if available)	100–150 grams or as available in original container	Foods should be left in their original containers if possible. If transferring, place food into a sterile unbreakable, puncture resistant container and label carefully. Place containers individually in leak-proof containers (e.g., sealed plastic bags) to prevent cross-contamination during shipment. Store specimens at 4°C. Ship on cold packs as soon as possible. Note: Empty containers with remnants of suspected foods can be examined.
Botulinum Toxin Producing Clostridia Subtyping (pulsed-field gel electrophoresis)	See above	See above	See above

* If botulism is suspected, notify the local health department immediately to discuss the case and laboratory testing (see www.vdh.virginia.gov/LHD/index.htm). Specimens should be sent to Division of Consolidated Laboratory Services (DCLS) after LHD has been consulted and testing has been approved by LHD/DCLS. The DCLS Emergency Duty Officer can be reached 24/7 at (804) 335-4617. Specimens should be collected before treatment with antitoxin. In addition to specimen collection, the DCLS Blood and Body Fluid Submission Form should be completed with the appropriate test request.

[†]Acceptable samples by form of botulism: Foodborne: serum, stool, vomitus, gastric contents and food. Wound: serum, debrided tissue, swab from wounds, and stool. Infant: stool, rectal swabs and potential sources.

Note: Laboratory criteria for diagnosis are the detection of botulinum toxin in serum, stool, or patient's food or isolation of *Clostridium botulinum* from stool.

5. Treatment

The diagnosis and treatment of botulism should be made on the basis of the case history and clinical findings. **Treatment should be initiated once botulism is clinically diagnosed and should not wait for laboratory confirmation.** In particular, botulinum antitoxin should be administered as soon as possible. Antitoxin does not reverse paralysis but arrests its progression. For non-infant forms of botulism, Heptavalent Botulinum Antitoxin (HBAT) is available at CDC through consultation with the local and state health departments. For infant botulism, human-derived botulism antitoxin (also known as BabyBIG) is available at California Department of Public Health (www.infantbotulism.org). To obtain BabyBIG for a patient with suspected infant botulism, the patient's physician must first contact the on-call physician of the Infant Botulism Treatment and Prevention Program (IBTPP) at the California Department of Public Health at 24-hour telephone: (510) 231-7600 to review the indications for such treatment. Note that in a bioterrorism attack, human-derived botulism antitoxin should not be administered.

There is no indication that treatment of children, pregnant women, or immunocompromised persons with botulism should differ from standard therapy. Meticulous supportive care, including artificial ventilation and nutritional support, should be provided when indicated.

6. Post-exposure Prophylaxis

Antitoxins are not useful for preventive purposes. Asymptomatic persons with exposures to botulism toxins or *Clostridium botulinum* spores should be monitored closely for signs and symptoms and should be treated promptly with antitoxin at the first signs of illness. Those known to have eaten incriminated food should be purged with cathartics, given gastric lavage and high enemas and kept under close medical observation.

7. Vaccination

Currently, there is no licensed vaccine for commercial use.

8. Infection Control

Person-to-person transmission of botulinum neurotoxin does not occur. Standard Precautions are adequate for the care of patients with botulism. Patients do not need to be isolated. Foods suspected of contamination should be promptly removed from potential consumers and submitted to public health for testing. Those known to have eaten incriminated food should be kept under close medical observation.

9. Decontamination

If exposure to the botulism toxin via aerosol inhalation is suspected, the clothing of those who are exposed must be removed and stored in labeled double plastic bags until it can be washed thoroughly with soap and water. The exposed persons must shower thoroughly with soap and water. Contaminated objects or surfaces should be cleaned with a solution of 1 part household bleach to 9 parts water (0.5% sodium hypochlorite solution) to inactivate the botulism toxin.

10. Postmortem Practices

Standard precautions should be used for postmortem practices. These include using a surgical scrub suit, surgical cap, impervious gown or apron with full sleeve coverage, a form of eye protection (e.g., goggles or face shield), shoe covers, and double surgical gloves with an interposed layer of cut-proof synthetic mesh. Autopsy personnel should wear N-95 respirators during autopsies. Powered air-purifying respirators (PAPRs) equipped with N-95 or high-efficiency particulate air (HEPA) filters should be considered for postmortem practices. Bodies infected with biological terrorism agents including *Clostridium botulinum* should not be embalmed.

11. Public Health Measures

- Suspected or confirmed botulism cases should be reported immediately to the local health department. See <http://www.vdh.virginia.gov/LHD/index.htm>.
- Laboratory specimens should be sent to the state public health laboratory (DCLS) for confirmation of agent and other studies after consultation and approval. The DCLS Emergency Services Officer can be reached 24 hours a day/7 days a week at (804) 335-4617.
- Designated public health authority should begin an epidemiologic investigation. The activities include:
 - Public health authority will coordinate the delivery of antitoxin to the physician.
 - Collect detailed information from the patient and close contacts if necessary about the source of the exposure, in particular food history.
 - Investigate contacts of the patient for compatible illness to identify a potential common exposure. Persons who may have consumed any contaminated food items should be monitored closely.
 - Suspected food items (e.g., home canned foods) should be collected for possible testing. VDH's Office of Epidemiology will work with the U.S. Food and Drug Administration if commercially prepared food is implicated.
 - Implement control measures to prevent disease and additional exposures. For laboratorians or others potentially exposed who might have worked with the agent before identification as *Clostridium botulinum*, post-exposure monitoring might be recommended based on a risk assessment.

12. References and Resources

Adalja AA, Toner E, Inglesby TV. Clinical management of potential bioterrorism-related conditions. *NEJM*. 2015; 327 (10): 954-962. Available at <http://www.nejm.org/doi/pdf/10.1056/NEJMra1409755> (accessed March 10, 2015).

American Public Health Association. Anthrax. In: Heymann DL, ed. *Control of Communicable Diseases Manual*. 20th ed. Washington DC: American Public Health Association; 2015: 71-77.

Arnon SS, Schechter R, Inglesby TV, et al. Botulinum Toxin as a Biological Weapon: Medical and Public Health Management. *JAMA*. 2001; 285(8):1059-1070.

Centers for Disease Control and Prevention (CDC). Botulism General Information: Frequently Asked Questions. Available at <http://www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism/> (accessed December 11, 2014).

Centers for Disease Control and Prevention (CDC). Medical Examiners, Coroners, and Biologic Terrorism: A Guidebook for Surveillance and Case Management. *MMWR*. 2004; 53 (No.RR-8): 1-44.. Available at <http://www.cdc.gov/mmwr/pdf/rr/rr5308.pdf> (accessed December 11, 2014).

Centers for Disease Control and Prevention (CDC). National Notifiable Diseases Surveillance System Case Definitions. Available at <http://wwwn.cdc.gov/nndss/script/casedefDefault.aspx> (accessed December 11, 2014).

Coban A, Matur Z, Hanagasi HA, Parman Y. Iatrogenic botulism after botulinum toxin type A injections. *Clin Neuropharmacol*. 2010; 33(3):158-160.

Ghasemi M, Norouzi R, Salari M, Asadi B. Iatrogenic botulism after the therapeutic use of botulinum toxin-A: a case report and review of the literature. *Clin Neuropharmacol*. 2012; 35(5):254-257

Orphanet. Adult intestinal botulism. Available at http://www.orpha.net/consor/cgi-bin/OC_Exp.php?lng=EN&Expert=178487 (accessed December 11, 2014).

American Society for Microbiology. Sentinel Level Clinical Laboratory Guidelines for Suspected Agents of Bioterrorism and Emerging Infectious Diseases: Botulinum Toxin (revised June 2013). Available at http://www.asm.org/images/PSAB/Botulism_July2013.pdf (accessed December 11, 2014).

World Health Organization. Botulism (updated August 2013). Available at <http://www.who.int/mediacentre/factsheets/fs270/en/> (accessed December 11, 2014).